

# **iGEM SHEFFIELD 2014**

## **NOTIONS OF RESPONSIBILITY STUDY**

**WHERE DOES THE RESPONSIBILITY LIE FOR THE  
MAINTENANCE OF DRAINS DAMAGED DIRECTLY BY  
FATS, OILS AND GREASES?**



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## INTRODUCTION

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In the UK, as elsewhere, the idea of responsible research and innovation has grown in recent years (eg. Owens). As a component of our policy and practices project, we aimed to identify *notions of responsibility* to understand stakeholder perceptions of where this lies.

To carry out our research, we conducted semi-structured interviews with different groups of people including representatives from the water industry, Sheffield City Council, restaurants and homeowners. The interviews were designed to identify where each sector felt that the responsibility should lie in fat, oil and grease (FOG) management. We aimed to identify if there was a difference in responses between sectors and/or a difference between representatives of the same sector.

Furthermore, we compared the research results obtained with the relevant UK laws and legislation in this area to analyse how different people's judgment differs on whose responsibility it is to deal with FOGs from what is recognised by law. This extensive analysis would allow us to identify how well informed each sector was regarding the policy of FOG waste disposal and the reasoning behind why each of the sectors at times would chose to be non-compliant with the existing policy in place. All of the research undertaken in this study allowed us to further shape our product.

## **BACKGROUND**

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The companies that deal with waste water in the UK address approximately 200,000 sewer blockages every year, three quarters of which are caused by FOGs. It takes millions of pounds per year to remove these blockages and get the sewer lines operational again. These costs are ultimately passed on to the customer through water bills.

In addition, given that sewers are not designed to carry these forms of waste, the FOG accumulation can cause public discharges of untreated wastewater to the roads, streams and rivers, or even in homes and businesses, creating obvious health and hygiene concerns.

The law has clear regulations in place that define where the responsibility lies for those blockages. However, upon contacting experts in the field and analysing previous research we found that compliance with these regulations tends to be fairly low, particularly where small food businesses and hotels are concerned. Thus, the research undertaken attempted to understand the reason behind this low compliance and to better characterise the position of the water industry as service providers and characterise the three-way relationship between councils, water industry and businesses that dispose of FOGs.

## **METHODS**

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We carried out several semi-structured interviews with members of each of the main stakeholder groups. We chose this as our method as it gave us the

freedom of tailoring the questions to the responses and also the interviewee. We had a few base questions for each stakeholder used throughout as a guide:

**Restaurants and Home Owners:**

1. How do you dispose of fats?
2. Why do you dispose of fats in this way?
3. What do you think happens to the waste after you've dealt with it?
4. Where do you think the responsibility lies for the maintenance of urban drainage that has directly been damaged by Fats Oils and Greases (FOGs)?

**Water Industry:**

1. Where do you think the responsibility should lie for the maintenance of urban drainage that has directly been damaged by Fats Oils and Greases (FOGs)?
2. How are FOGs dealt with currently? Who is involved in that decision?
3. What other solutions have been considered?
4. Would the water industry be willing to subsidise innovation at the consumer end? (explain idea)

**City Council:**

1. Does the city have any problems with the disposal of fats, oils and greases?
2. What collection system is used for collection of waste FOGs?
3. Do businesses and homeowners generally comply with guidelines regarding disposal of FOGs?
4. Who do you think is responsible for dealing with these kinds of issues?

5. Would the council be willing to subsidise innovation at the consumer end?

Full ethical approval was gained. All interviews were recorded and stored anonymously to protect participant's identity. The interviews were then transcribed and analysed using discourse analysis (Bryman).

All volunteers taking part in this research were provided with a consent form and an information sheet explaining how the data obtained will be used. They were also informed of their freedom to withdraw at any point from the social research. All documents used to gain the ethical approval are attached at the end of this report.

## **RESULTS AND DISCUSSION**

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### **Current practices & motivations**

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We interviewed six food establishments based in Sheffield and found that there were a range of options for food businesses to dispose of FOGs. Three of the businesses paid for their FOG waste to be collected by an extra bin collection administered by the council (or Veolia S.A on behalf of the council), one transported their own waste to a recycling facility where they paid Biffa plc to take it, and two were paid by a private company called Olleco Ltd. In the last case the company collected and recycled FOGs into biodiesel and other products, paying the establishments £3 per litre for used cooking oil.

The interviewees explained their FOG disposal decisions in different ways. Their justifications included practicality, convenience, financial and environmental concerns which appeared to be related to their arrangements. As examples:

Financial:

*“If you can get paid for it then what’s the point tipping it down the drain.”*

*(R&H2 interview)*

Convenience:

*“Easier, to just put it in the blue bins that have been provided. So I don’t have to do nothing, just pour it in. The company comes and takes it.”*

*(R&H4 interview)*

Some interviewees appeared to be unaware about alternative options available to them and sometimes assumed their method was standard practice among similar businesses.

*“Everyone does it exactly the same. Every single place, even McDonalds.”*

*(R&H4 interview)*

*“I’ve always been a manager in hospitality and it’s how we’ve always done it.”*

*(R&H3 interview)*

This shows that systems and arrangements of FOG disposal were wide-ranging and motivated by a variety of interests. It also demonstrates a reluctance to make changes to current practices.

The situation is complicated further when the advice given by the council and the water industry is taken into account. Yorkshire Water has a large section of its website dedicated to informing customers about proper FOG disposal practices.

*“Putting cooking fat down your drain can block our sewers and lead to flooding”*

*“Let leftover fat, oil and grease cool, then pour into a suitable container and put in the bin”*

*(Yorkshire Water website, accessed 17/09/2014)*

One interviewee, a council member, also claimed their city preferred residents to bin their FOG waste, but for a different reason. The city operates an energy recovery facility where household waste is burnt to produce heat that is then fed back to buildings in the city. Waste has a high energy density, making it ideally suited to this process, but the council do not provide residents with explicit advice regarding this method of disposal.

*“We don’t provide any advice particularly to people about that...we would prefer that it went to people’s black bins. If it goes to people’s black bins the reason we prefer that is that because it then goes to our energy recovery facility”*

*(Council 1 interview)*

Our relatively small study implies that while the same disposal method is preferred by the two major stakeholders, this method is preferred for different reasons and these reasons are not always fully communicated to all

stakeholders, perhaps resulting in the wide ranging disposal practices highlighted in our restaurant and homeowner interviews.

## Responsibility

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As part of our research we asked participants where they thought the responsibility should lie for the maintenance of urban drainage that has been directly damaged by fats, oils and greases. A range of responses were noted, examples grouped by sector:

*“I think a lot of it’s down to people at home, because I think they’re worst for it”*

*“I think the water board should be responsible”*

*“Between all of us, if we’re not doing it then they [water industry] can’t do their job”*

*“Chemical companies, not the restaurants”*

*“I’d say it’s both”*

*“Each person, yeah definitely”*

*(R&H interview 1,2,3,4,5,6)*

*“Well for maintenance, I think it lies with the water company... but on the other hand, I think it’s the responsibility of the trader to check their effluent complies with the regulation”*

*“Maintenance of the sewer network is obviously with the water company however... there has to be an element of cost where possible to the perpetrator”*



*“The responsibility should lie with the sewage undertaker... for carrying out any maintenance. The cost however could be recharged to commercial customers should it be deemed that they are responsible for the problems in the sewer”*

*(Water Industry interview 1,2,3)*

*“I would imagine the water company”*

*(Council interview 1)*

Another topic that came up a lot in our research was the difficulty in proving exactly which establishment was the cause of a particular blockage. All three industry interviewees spoke of a major issue in tackling FOG problems; while they can threaten to prosecute suspected repeat offenders, this is often not a reality without thorough and costly investigative work.

*“Very often it is impossible to do that [issue fine] because it is impossible to trace back”*

*(Water Industry interview 2)*

This leaves water companies with very limited options when dealing with users they think are the cause of problems downstream. In our research they all mentioned a preference to provide education, advice and guidance to establishments before fines and prosecution.

*“We explain that we want to help them and support them and basically give advice”*

*(Water Industry interview 1)*

The views of some food establishments were somewhat at odds with this industry claim, instead feeling that restaurants were unfairly blamed for the majority of FOG problems:

*“I mean obviously the water board would be blaming it on restaurants because they’ve got no-one else to blame”*

*(R&H 2 interview)*

One additional suggestion that emerged from our research was the possible role played by consumer ratings. Because the industry is highly monopolised, it is regulated by OFWAT (Water Service Regulation Authority, a national regulator that sets prices and monitors the quality of service provided to customers. Negative consumer ratings can lead to substantial penalties being imposed. Since these penalties can carry higher financial costs than those from clearing blockages, the industry might be incentivised to save money by practicing leniency and keeping more customers satisfied.

Our research also highlighted the added complication posed by perceived differences in FOG disposal practices among customers of different ethnic backgrounds. There is general agreement within the industry that a higher proportion of FOG blockages are caused by restaurants dealing with fatty or oily food, in particular certain ethnic varieties. This perception is difficult for a number of reasons. Firstly, as previously mentioned, it is extremely difficult to trace back specific blockages to specific businesses, so the evidence is very often based on correlation rather than causation. Secondly, even if the industry perception were valid, water companies would be reluctant to act on it in any way, for fear of being

seen to be targeting specific groups, which might again link back to OFWAT ratings and penalties.

## Law & Policy vs Enforcement

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We looked into the legal requirements and policy-making of waste management and specifically FOG handling. The research into the legal side allowed us to analyse how well informed the different sectors interviewed (businesses, homeowners, water Industry and Councils) were in this area. Furthermore it allows us to gain some understanding on to what level the law is actually enforced and whether the level of this enforcement may be dictating where people think the responsibility for FOG management lies.

According to the *Water Industry Act 1991, Section 111* it is a criminal offence to discharge into the public sewers any matter which may interfere with the free flow of wastewater. This act also states that where the water company has incurred costs in dealing with the detrimental effects on the sewers (including blockages) incidents, legal action to recover these costs may be taken and that prosecution can result in substantial fines or even imprisonments.

As mentioned previously there are a number of ways that in the past have been used to managed waste FOGs such as incorporating grease traps as a physical barrier and then collecting the waste and wither disposing of it in the bin or collecting it to be used for biodiesel production. The latter option is normally preferred in large franchising food restaurants and supermarkets where the there is a constantly high production of FOGs. Other uses for FOGs in the past have involved using it as an ingredient in animal feed. However, as of 1/11/2014

according to the Animal By-Products Regulations 1774/2002 (ABPR) waste-cooking oil from catering premises can no longer be used for this end, and the collection of waste cooking oil must be done via a licensed waste carrier. During the course of the project iGEM Sheffield contacted different restaurants to enquire about how they disposed of Fats Oils and Greases as part of one of our research questions. In this process, we found that one large branch of restaurants still use their FOGs for cattle feed, revealing that there is either a lack of information to some degree regarding this new law or alternatively that people know about it and chose not to comply.

Moreover according to the Safety Act 1990, problems arising from the effect of FOGs, resulting in a failure to comply with Food Hygiene Regulations may also result in prosecution and an emergency prohibition order preventing trading from the premises.

Even though Waste Water Companies are legally responsible for the management of the maintenance of the sewers, it is the local authority's environmental health department to deal with "any reported complaints of 'statutory nuisance' such as smells, effluents, accumulation of refuse or any premises in such a state as to be prejudicial to health or a nuisance." However if it is found that the reason for these complaints are due to the lack of maintenance of the Water Companies then they may be held responsible for this. Further to this if the Waste Water companies finds that there are recurring blockages that have been caused by a specific business (e.g. restaurant) then they may be held responsible (by law) for covering the value of clearing up the blockage (up to £ 30 000). However, in most circumstances the Water Companies will not fine the

perpetrators. Instead they opt for an educational approach into the ways that FOGs may be dealt with most efficiently. In some occasions and after recurring blockages from the same source have occurred the Water Industry will enforce the law and fine the business to their offense. However, Water companies tend to do this only as a last resource because fining customers is likely to result in losing customers as well as lower satisfaction ratings from customers that in turn are likely to result in low satisfaction ratings that can result in the Water Companies losing annual government funds if the ratings go below a certain level given that the funds are attributed competitively between Water companies.

## Education

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When interviewing restaurant representatives we found that while they were able to differentiate between 'good' and 'bad' practices with respect to FOG waste disposal, most of the interviewed sample appeared to be less informed as to the potential consequences of inappropriate FOG waste disposal. When questioned about why they disposed of FOG waste the way they did and why they thought the FOG waste was taken once it was collected we obtained the following responses:

*"It's just procedure I guess."*

*(R&H6 Interview)*

*"I hope it just all goes to the bin."*

*(R&H6 Interview)*

When interviewing different water companies, it was interesting to see that all of them felt they had a very predominant educational role with respect to restaurants and other businesses. Despite them presenting slight differences in

their policies it was interesting to find out that several companies had assigned teams to liaise with businesses suspected of being non-compliant with FOG disposal law guidelines and that were most likely responsible for a given blockage.

All the wastewater companies interviewed stated that at a first instance they would adopt an educational approach to handle the issue. I.e.: suggesting how the business could alter some of the practices to avoid blockages in future. All  $\frac{3}{4}$  of the companies interviewed said they would suggest and advise on measures that could be taken by the businesses (such as getting a grease trap) but would not themselves impose or financially support these. However one company said that in the case of recurring blockages they would provide/ take the necessary measures to avoid it happening again since the blockages result in a fairly large financial detriment for the company.

#### First time offenses:

*“(…) they’ve caused the problem and it’s a case of working with them to prevent it happening again(…)”*

*(R&WI1 Interview)*

*“...if it’s the first time we might not charge them for the cost (Interviewer 1: OK) we’d prefer they invested that money we’d take on the cost of the clean up as long as they invest the money in on site treatment to prevent it happening in the future”*

*(R&WI1 Interview)*

*“(...) the first time it happens we visit the premises, we’ll enter them and give them advice as to how they should be dealing with their fat and grease.”*

*(R&WI3 Interview)*

*“I’ll explain their regulatory requirements to them erm give them advise on the scraping process basically give them all the equipment to prevent it.”*

*(R&WI Interview)*

*“Our main solution to dealing with FOGs from the source is by education. We have had a number of concerted campaigns (...) we’ve also had proactive visits to commercial food premises in certain hotspots to advise them”*

Given that in the course of this research we found that commercial food establishments were opting for a number of different practices with respect to FOG collection, and that according to our interviews with the water industry the advice provided by them was mostly limited to methods to keep the FOG waste separated from the drainage system, we decided to investigate whether Sheffield City Council offered an advice with regards to collection of this waste.

We found that despite the Council preferring that this type of waste were disposed in black bins because they could be taken to the energy recover facility, they do not offer any particular advice or guidelines as to how homeowners or business owners should dispose of their FOG waste. The loosely defined guidelines and lack of standardisation of practices explains the wide range disposal practices found across different food businesses.

*“We don’t provide any advice particularly to people about that.”*

## Innovation

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To give another dimension to the project we are undertaking, we looked into whether the different water industries interviewed thought a subsidization of the under-the-sink product we are designing, by them, could be possible. Most companies responded to this question very promptly and concordantly with each other generally giving a negative answer and explaining that the reason for this is because it is lawfully the consumer's responsibility to afford the equipment that will help them comply with guidelines.

*“at the consumer end it's the consumers responsibility(...)”*

(R&WI1 Interview)

When asked about technological innovation with respect to new methods of removing and/or degrading FOGs through the analysis of their discourse we found them to be a slightly resistance to change/ innovation. As examples:

*“We have a traditional approach to dealing with FOGs in sewers and it's through mechanical removal (...)”*

(R&WI2 Interview)

*“(...) there are so many biodosing products that water UK was asked to investigate all the products and find which actually worked because there's not a lot of research, independent research, on these products within the network”*

(R&WI1 Interview)



*“We have tried the use of bioremediation in chemicals with moderate success however those practices are not something we wish we were familiar. There are a set of people in business who see them as maybe potentially problematic and there is evidence in some cases that it is very costly (...)”*

*(R&WI2 Interview)*

Our findings agree with papers by Molyneux-Hodgson and Balmer, 2014<sup>1</sup>. The research examines how the discourses of academics and members of the water industry shape over time to become less receptive to the required technological innovations initially suggested. The paper examines specifically how synthetic biology is perceived in this field, being generally categorized as high-tech.

The data obtained in our research supports these previously reported findings that the water Industry appears to be conservative with regards to innovation. From the interview data we are further able to hypothesize that this conservative approach may be driven by the already established network between Water companies and the existing competitiveness in this Industry that attributes to change, a greater risk.

## **SUMMARY**

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The range of available approaches for dealing with FOG problems that were identified during the interview process demonstrates the complexity of the

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<sup>1</sup> Molyneux-Hodgson S. and Balmer A. (2014) Synthetic biology, water industry and the performance of an innovation barrier. *Science and Public Policy*, 41 (4): 507-519. doi: 10.1093/scipol/sct074

situation and the need for a well thought out solution. In order to develop something that would work on more than a purely technical level, we were required to take much from our conversations with the major stakeholders. A functional product is worthless if it will never be implemented, so understanding the complicated web of motivations and needs on all sides of the issue has been a requirement to shape our progress and mould our decisions on a daily basis.

Our research highlights a need for greater clarity in the way issues relating to FOG disposal are communicated. The restaurant and homeowner interviewees showed a particular lack of knowledge regarding the options that were available to them, and might have chosen better had they been better informed. Any fats and oils that get collected with black bin waste go to the city's energy recovery facility, where they are burned to provide free energy. Unfortunately, the council does not communicate this information to establishments, resulting in private companies moving in to profit from them.

The current practices section of the interview revealed wide ranging justifications for disposal methods, but it gave us some key considerations when thinking about how we would design and target the product. Potential end users described the main reasons for their current approaches as financial, environmental, practical and convenient, attributes we fed back into the design process to improve its suitability.

Unsurprisingly, most stakeholders see the responsibility for FOGs and their effects as a balance. Restaurants are often willing to comply with effluent laws if this route is easy, cheap and doesn't cause them any inconvenience. In our limited sample size, two R&H interviewees directly attributed blame, one to

households and another claiming that they themselves were blamed by the water industry, although in general interviewees were quite balanced. The water industry were always willing to take direct responsibility of the maintenance, but felt that unreasonable effluent pollution should be attributed back and a dialogue should be instigated, typically starting with advice and guidance and ultimately leading to fines and prosecution. There also seems to be an implicit attribution of blame towards restaurants serving ethnic food, and this might be an area worthy of further study to establish if they really do cause a lot of the problem, and if so what could be done about it.

## **ETHICS APPROVAL**

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On the 6<sup>th</sup> August, before conducting our research, we gained ethical approval through the University Research Ethics Committee at the University of Sheffield. This allowed us to begin our research as we had clearly outlined our aims and objectives alongside methods and how we would ensure confidentiality. In support of our application request, we provided an information sheet and consent form attached below to show how this would be done.

### **Information Sheet**

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# Information sheet for research participants

## Project title

Maintenance of drainage and sewage systems damaged directly by FOGs (Fats, Oils and Greases): where's the responsibility and where does synthetic biology fit in?

## Invitation

We are a team of undergraduate researchers participating in a university competition. You are being invited to take part in an undergraduate research project. You have been contacted because in your line of work you might have to deal with Fats, Oils and Greases (FOGs), a member of a company that manages waste disposal, a member of a company responsible for water waste treatment or an expert in a field relating to water waste management.

Before you decide whether to take part in the research, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information.

Thank you for reading this.

## Purpose of the research

The research aims to investigate and understand:

- Perspectives on the issue of FOGs and senses of responsibilities in waste-water management.
- The people's ideas of the characteristics of a product that would help solve the issue of build up of FOGs in drainage systems.
- How different businesses and sectors would respond to synthetic biology approaches to resolving the issue of FOGs

## What to expect

It is up to you to decide whether or not to take part in my research. If you do decide to take part you will be given this information sheet to keep as it contains my contact details. You will be able to withdraw from taking part in the research at any time by contacting me directly.

I will carry out the interviews. They are not expected to last more than 20mins.

## Confidentiality

Any information that we collect will not be attributed to individuals without their explicit agreement. Any reports or papers that we write will contain anonymous information and the identification of labs and institutions will be kept to a minimum. Any digital recordings (audio/photo) made during this research will be used during my analysis and may be used for illustration in conference presentations, papers or lectures. No other use will be made of them without your written

permission, and no one outside the project will be allowed access to the original recordings. If being interviewed using audiotape, you will be asked to give verbal consent to the interview.

## **Outcomes**

While there are no immediate benefits to people taking part in the project, it is hoped that this work will contribute to the understanding of social, technical and financial responsibility in water waste management with respect to FOGs. The work produced will also help shape the development of our proposed product to fit the diagnosed needs of the market, as well as evaluate how receptive different sectors are likely to be to our solution.

Ethical approval

The project has received ethical approval from the University of Sheffield, Department of Chemical Engineering.

## **Contact**

If you have any questions or concerns about the work or you do not consent to participating in the project, please contact iGEM Sheffield 2014:

Email: [igem2014@sheffield.ac.uk](mailto:igem2014@sheffield.ac.uk)

If there are any problems that arise in connection with my work, please contact my supervisor at University of Sheffield, Phillip C Wright:

Email: [p.c.wright@sheffield.ac.uk](mailto:p.c.wright@sheffield.ac.uk)

If you decide to take part on the research, please sign the Consent Form attached.

**Many thanks,  
iGEM Sheffield**

Consent Form

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## Participant Consent Form

Title of Research Project: Maintenance of drainage and sewage systems damaged directly by FOGs (Fats, Oils and Greases): where's the responsibility and where does synthetic biology fit in?

**Participant Identification Number for this project:**  
**initial box**

**Please**

1. I confirm that I have read and understand the information sheet and I have had the opportunity to ask questions about the project.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline.
3. I understand that my responses will be kept confidential. I give permission for other members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research unless I give my consent.
4. I agree for the data collected from me to be used in future research
5. I agree to take part in the above research project.

☐☐☐☐☐

\_\_\_\_\_  
Name of Participant                      Date                      Signature

\_\_\_\_\_  
Name of person taking consent                      Date                      Signature

Copies:

*Once this has been signed by relevant parties the participant will receive a copy, to keep with the information sheet and any other written information provided. A copy of the signed and dated consent form will be placed in the project's secure storage.*